

Sections 3.2-3.3

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“The act of retrieving learning from memory has two profound benefits. One, it tells you what you know and don’t know, and therefore where to focus further study to improve the areas where you’re weak. Two, recalling what you have learned causes your brain to re-consolidate the memory, which strengthens its connections to what you already know and makes it easier for you to recall in the future.”

- Peter C. Brown, *Make It Stick*

(1) Suppose a 95% confidence interval for a population proportion is found using the 2SD method or the theory-based method. Which of the following will definitely be contained in that interval?

- A The p -value
- B The proportion of successes in the population
- C The proportion of successes in the sample
- D All of the above
- E None of the above

A 95% confidence interval for the proportion of Ripon College students that like Coca-Cola more than Pepsi is determined to be (0.62, 0.90). (2) What is the correct combination of the statistic collected by the researchers and the SD of this statistic?

- A $\pi = 0.50, SD = 0.28$
- B $\hat{p} = 0.62, SD = 0.14$
- C $\hat{p} = 0.76, SD = 0.14$
- D $\hat{p} = 0.76, SD = 0.07$
- E None of the above.

A 95% confidence interval for the proportion of Ripon College students that like Coca-Cola more than Pepsi is determined to be (0.62, 0.90). (3) What is the best interpretation of this CI?

- A We are 95% confident that between 62% and 90% of the students in this sample prefer Coke to Pepsi.
- B 95% of all random samples of this size will show that between 62% and 90% of the students in the sample prefer Coke to Pepsi.
- C We are 95% confident that between 62% and 90% of all Ripon College students prefer Coke to Pepsi.
- D 95% of all random samples of this size will produce this CI.
- E None of the above.

NBC News recently conducted a poll in regards to the Iowa Democratic Presidential Caucus and it was found that 68% of those 321 surveyed favored Hillary Clinton as the Democratic candidate for president in 2016. Does this provide evidence that more than 65% of Iowans favor Clinton?

Use this information and the **One Proportion** applet to find a confidence interval for the true proportion of Iowans that support Clinton in the 2016 primary.

(4) Select the interval below that most closely matches your result.

A 0.68 ± 0.025

B 0.65 ± 0.03

C 0.68 ± 0.05

D 218 ± 16.5

E $(0.72, 0.64)$

Can we use Theory-Based Inference?

In the similar poll as in last question conducted by Loras College in Iowa, Bernie Sanders was favored by 4% of 242 Iowans surveyed as the Democratic candidate for president in 2016.

(5) Can the **Theory-Based Inference** applet be used to reliably find a confidence interval for the corresponding parameter?

- A Yes, we have far more than 20 observational units in our sample.
- B Yes, we have more than 10 surveyed Iowans that don't favor Sanders.
- C No, we have fewer than 10 surveyed Iowans that favor Sanders.
- D No, we are missing information required to use that applet.

In the similar poll as in last question conducted by Loras College in Iowa, Bernie Sanders was favored by 4% of 242 Iowans surveyed as the Democratic candidate for president in 2016. Do we have evidence that fewer than 10% of voters in Iowas prefer Sanders?

(6) Use the **One Proportion** applet and the 2SD method to calculate a 95% confidence interval for π . Use this result to determine whether we have support for the conjecture.

- A Yes, 4% is less than 10% so we must have evidence.
- B Yes, 10% is larger than the upper limit of the confidence interval centered at the statistic.
- C No, 4% is included in the confidence interval centered at 10%.
- D No, simulation-based methods require validity conditions that weren't met so we cannot have evidence against the null.
- E We cannot answer this question without calculating the p -value.

(7) When 293 college students are randomly selected and surveyed, it is found that 114 own a car. Use any appropriate method discussed in Sections 3.2 and 3.3 to construct a 99% confidence interval for the percentage of all college students who own a car.

A (0.333, 0.445)

B (0.342, 0.436)

C (0.316, 0.445)

D (0.323, 0.455)

E (0.316, 0.462)

(8) How many unpopped kernels are left when you pop a bag of microwave popcorn? The quality control personnel at a company that manufactures microwave popcorn take a random sample of 50 bags of popcorn. They pop each bag in a microwave and then count the number of unpopped kernels yielding $\bar{x} = 18$ and $s = 15$ unpopped kernels. Use the appropriate formula to give a 2SD 95% CI for the mean number of unpopped kernels for all bags of this microwave popcorn.

- A $(-12.0, 48.0)$
- B $(13.8, 22.2)$
- C $(15.9, 20.1)$
- D $(17.7, 18.3)$
- E $(17.5, 18.6)$

(9) Typically, how much sugar is in a low calorie cookie? You take a random sample of 25 low calorie cookies and test them in a lab, finding a mean sugar content of $\bar{x} = 3.2$ grams and a standard deviation of 1.1 grams of sugar. If 9 of your classmates each take their own random sample of 25 low calorie cookies, producing their own values of \bar{x} and s for their samples, what would you predict for the SD of the 10 \bar{x} values?

A It should be close to $\frac{1.1}{\sqrt{25}} \approx 0.22$ grams of sugar since

$$SE(\bar{x}) = \frac{s}{\sqrt{n}}.$$

B It should be close to $10 \times 1.1 = 11$ grams of sugar, since there are 10 samples.

C It should be close to $s = 1.1$ since s should be a good estimate of the cookie to cookie variability for all cookies.

D None of the above.

Key Ideas to Understand from Chapter 2 and Sections 3.1-3.3

- Observational unit
- Variable
- p -value
- Sample
- Population
- Statistic
- Parameter
- Left-skewed/Right-skewed
- Median/Mean
- Type I/Type II errors
- Significance level
- Confidence level
- Confidence interval
- Center of the confidence interval
- Margin-of-error
- 2SD Method for CIs